

# 521 M7280 – SATELLITE GEODESY

## SPRING SEMESTER 2017

### Homework No. 1

handed out Wednesday, March 01, 2017

due Wednesday, March 08, 2017, 09:10 Name: \_\_\_\_\_

### Basic GPS concept – from ranging to positioning

1. In a 3-D network with  $n$  points, all points are divided into two groups ( $n_s$  and  $n_r$ ,  $n = n_s + n_r$ ). Only range observation is possible between points of different groups (i.e., no observation is allowed between points in the same group).
  - What are the maximum and required numbers of observations in determining the relative and absolute positions of this network?
  - What is the minimum geometry condition in order to make this type of positioning feasible?

Use figures and tables to illustrate your results.
2. Derive analytically the maximum number of degrees of freedom ( $fn$ ) that can be achieved for the  $n$ -point network mentioned above. Plot in a 2-D map showing the relationships between  $n$  and  $fn$ .
3. In the case that range observations are also available between one of the groups (e.g., between the points in group  $s$ ), what would you revise your answer in 2?

**Your (individual) final report should contain (use A4 papers):**

- this page as the cover sheet
- source code(s) and outputs; do not forget to add your name and lots of comment cards to the source listing (% .....
- input and output files from program [input/output values used and calculated], if any
- plots, including captions on axes, title, your name, LB#/HM#, course title, date (if any)
- derivation and description of formulas used, accompanied by figures where applicable
- evidence of computational accuracy
- discussion of results